



A geometric interpretation of coherent structures in Navier-Stokes flows

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Mots-clés	almost-complex [5], Navier-Stokes [6], three-forms [7], turbulence [8]
Résumé en anglais	The pressure in the incompressible three-dimensional Navier-Stokes and Euler equations is governed by Poisson's equation: this equation is studied using the geometry of three-forms in six dimensions. By studying the linear algebra of the vector space of three-forms $\Lambda^3 W^*$ where W is a six-dimensional real vector space, we relate the characterization of non-degenerate elements of $\Lambda^3 W^*$ to the sign of the Laplacian of the pressure—and hence to the balance between the vorticity and the rate of strain. When the Laplacian of the pressure, Δp , satisfies $\Delta p > 0$, the three-form associated with Poisson's equation is the real part of a decomposable complex form and an almost-complex structure can be identified. When $\Delta p < 0$, a real decomposable structure is identified. These results are discussed in the context of coherent structures in turbulence.
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